

INFORMATION MANAGEMENT

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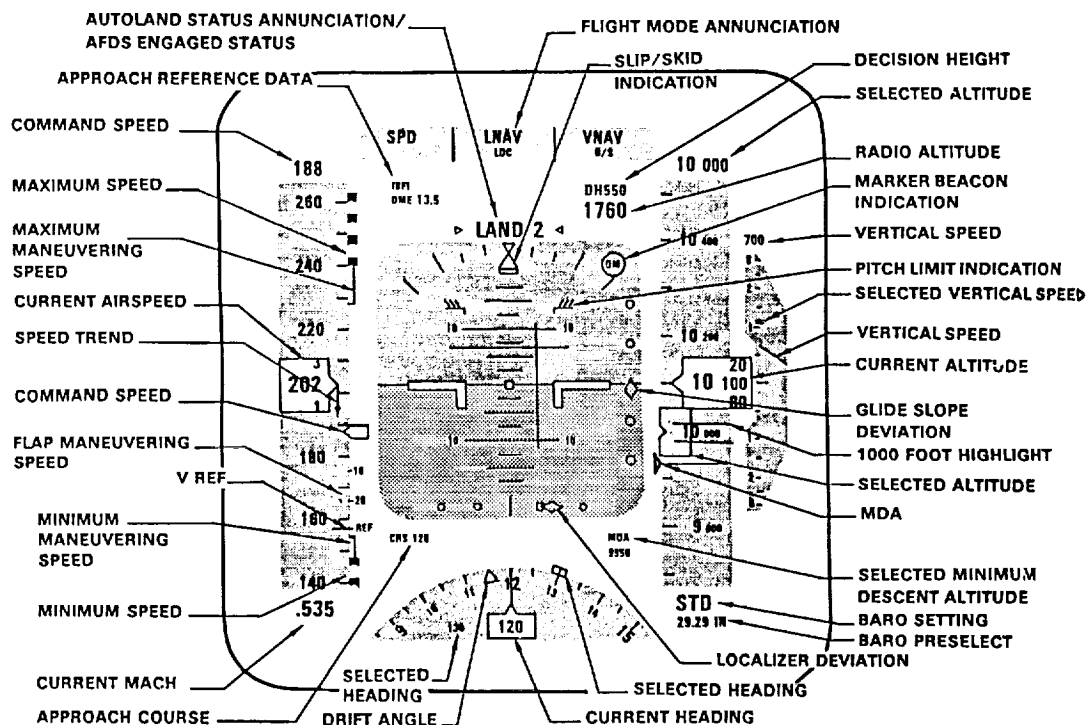
Outline

- **PFD Information Management**

- Problem
- TTFIM Approach
- Status

- Cockpit Information Management

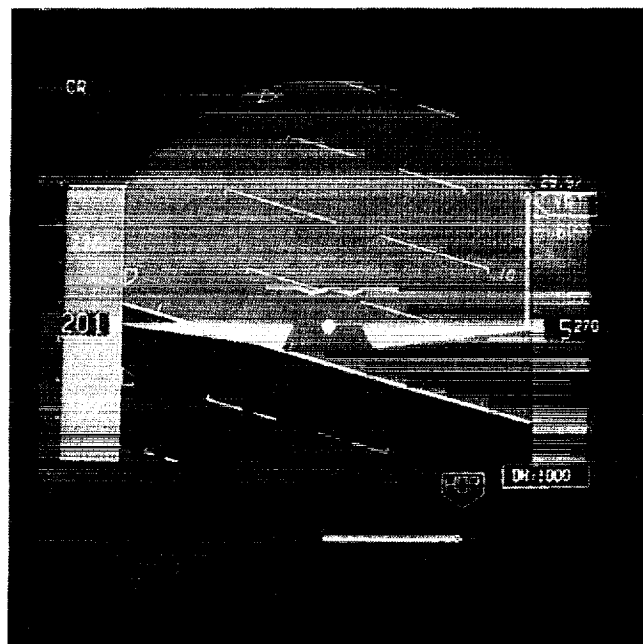
- Problem
- Information Management Objective
- System Characteristics
- Issues
- Approach



Information Management Problem with the PFD

Increased amounts of information on the
PFD increases the burden of interpretation

Target PFD Format

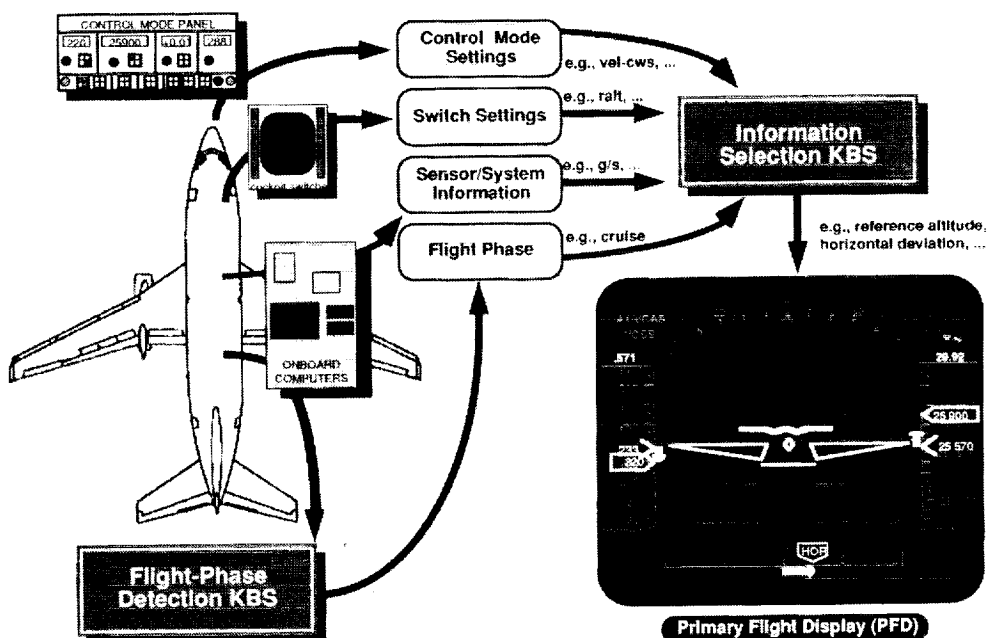


ORIGINAL PAGE IS
OF POOR QUALITY

TTFIM Approach

Decrease the quantity of information on the PFD by presenting only the information pertinent to the current tasks

PFD Information Management



Status of the PFD Information Management Work

- Validated the implementation and integration of TTFIM during June 1989 flight tests
- Completed implementation of automatic flight phase detection KBS and scheduled for validation during November 1989 flight tests
- Evaluation of the functional and operational utility of TTFIM will begin with the 1989 flight tests

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Information Management Problem in the Cockpit

Large quantities of information currently compete for the attention of flight crews, and the amount of information is expected to increase

Information Management Burdens

- Auditory**
 - ground control communications
 - aircraft-to-aircraft communications
 - intercrew dialogues
 - electronically generated speech and tone signals
- Visual**
 - radar signatures
 - multiple display configurations
 - number of displays
- Cognitive**
 - control mode configurations
 - cooperative action of independent, interactive agents
 - periods of situation monitoring with little or no action, and periods of extensive action

Information Management Objective

Explore techniques that present information in a manner that exploits the capabilities the flight crew brings to the cockpit

Key Characteristics of an Information Manager

- **Manage several media/formats**
- **Integrate across several programs and data sources**
- **Consider both pilot workload and tasking**
- **Factor in the information demands of the systems**
- **Account for the interactions among human performance variables, equipment characteristics, and mission/environment imposed demands**

Technical Issues

- How do we prioritize information?
- How should new information be melded with old information?
- How will the content of each possible piece of information and its potential impact be evaluated?
- How are priorities ranked relative to goals (mission, tactical, safety)?
- How are the priorities of old messages changed?
- What information sources should be included?
- What hardware and software architectures are suited for supporting information management?
- What kind of feedback from the aircrew is necessary?
- How will it support multimember crews?

COCKPIT INFORMATION MANAGEMENT APPROACH

- **Survey the Current State-of-Cockpit Information Environment**
 - **Identify Management Principles to be Invoiced Near/Long Term**
- **Abstract Current Information Flow for Designated Flight Phases**
- **Provide Functional Decomposition for Communication Management**
- **Design Architecture for Expert Assistance**
 1. **Prioritize**
 2. **Compose**
 3. **Format and Display**
- **Evaluate Effectiveness**

COCKPIT INFORMATION MANAGEMENT: FUNCTIONAL REQUIREMENTS

- **Flight Phase and Aircraft Situation Responsiveness**
- **Flight Crew Responsive Display Configuration**
- **Prioritization and Composition of Information**
- **Facility for Storage, Retrieval, Review and Repetition of Information**

COCKPIT INFORMATION MANAGEMENT SYSTEM: FUNCTION

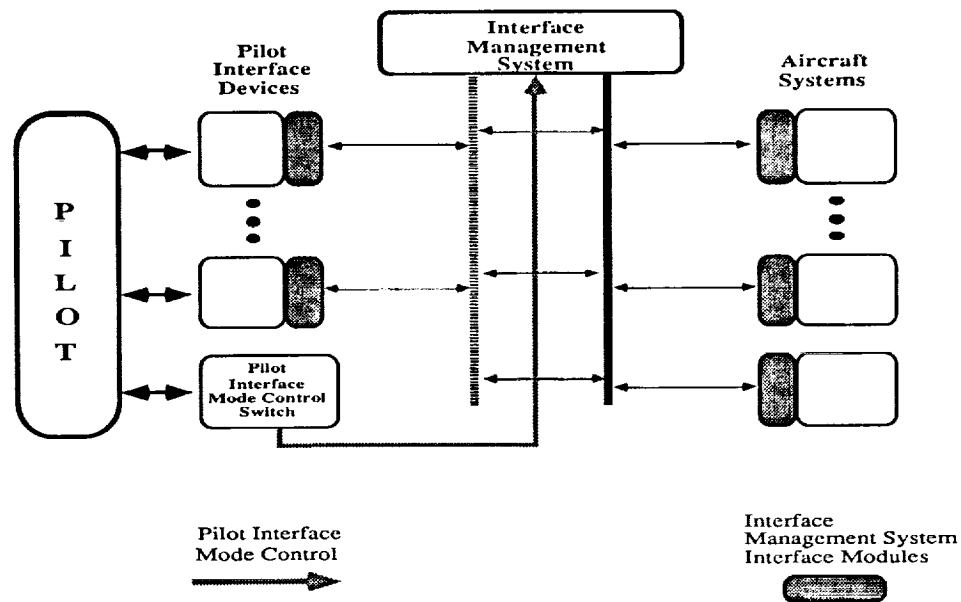
**Integrate Information Across Avionics Devices and Data Sources
so that One Interface Provides Full Access to Systems**

**Integrate Presentation Across Display Modalities so that the
System Can Manage Several Formats for Information Display**

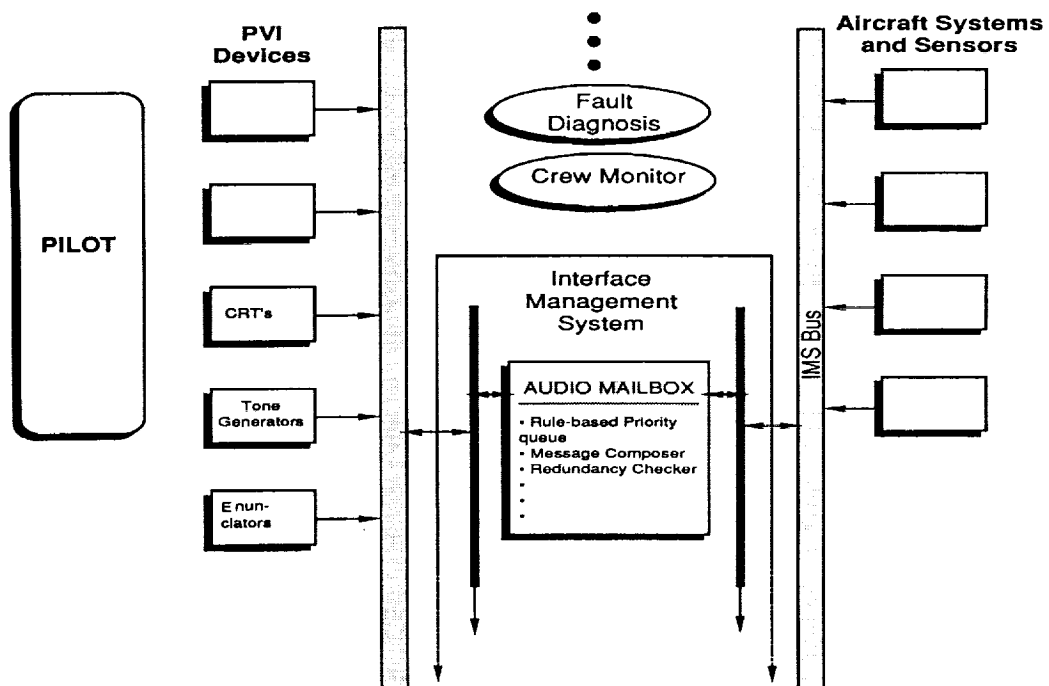
COCKPIT INFORMATION MANAGEMENT SYSTEM IMPLEMENTATION STAGES

- **Specification of Message Interactions that is Format Independent**
- **Develop Functional Knowledge Base of Information Exchange Requirements and Dialogue Structures**
- **Abstract Characterization of Data Types, Sensor Systems, and Communications Links**
- **Develop Methodology for Controlling Media Interaction:**
 - **Format**
 - **Timing**
 - **Consistency/Error Checking**
 - **Storage**

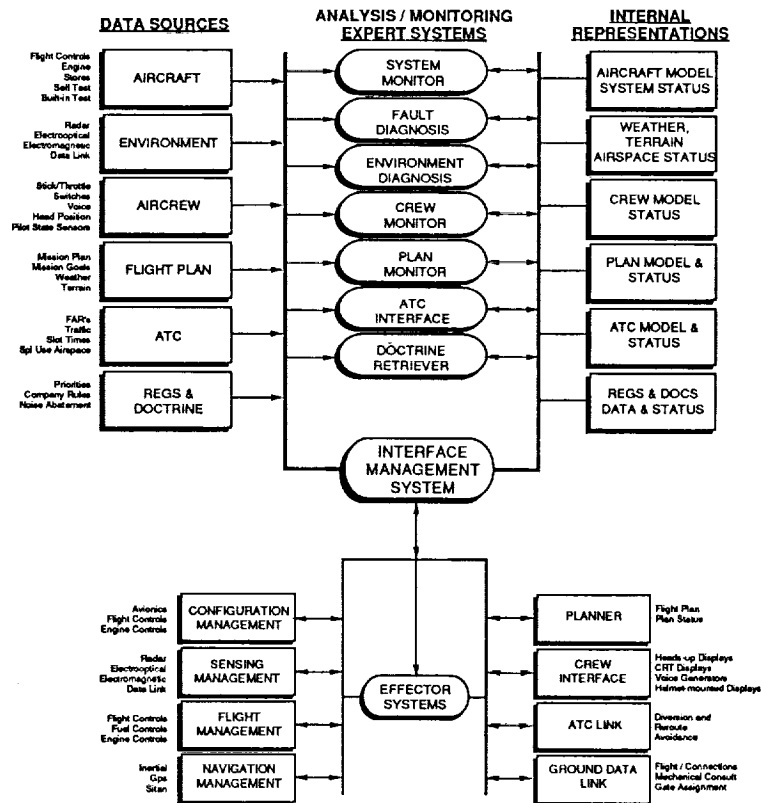
THE INTERFACE MANAGEMENT SYSTEM MANAGES THE FLOW OF INFORMATION AND THE DIALOGS BETWEEN THE SYSTEMS AND THE PILOT



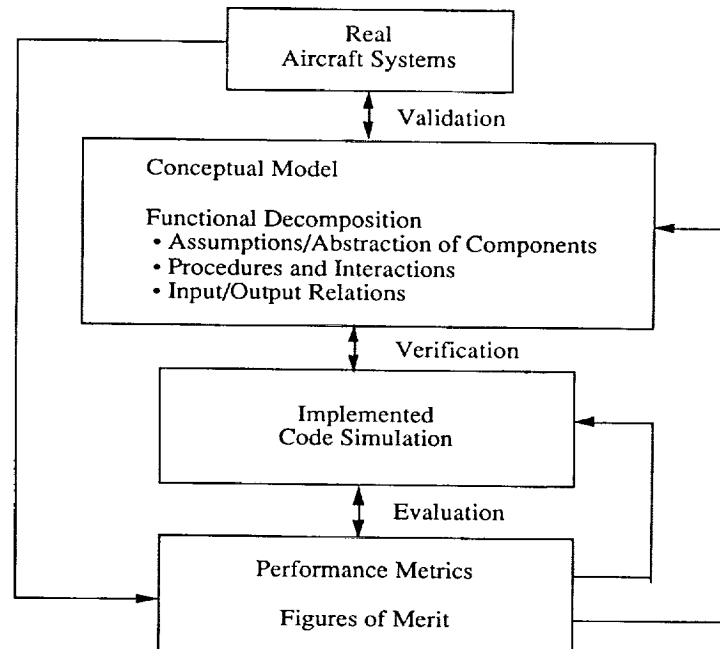
AUDIO MAILBOX ARCHITECTURE AND INTERACTIONS WITH IMS



OVERALL A3 ARCHITECTURE



MODEL/IMPLEMENTATION ASSESSMENT PROCESS



FUNCTIONAL VALIDATION (SOME DEFINITIONS)

VERIFICATION: Comparison of the Conceptual Model or System Design to the Software that Implements that Design

VALIDATION: Determination of the Accuracy with Which the Model or System Captures the Function of the Real World Operation

EVALUATION: Comparison of the Target System's Operation to Current or Alternative Systems